U. S. DEPARTMENT OF AGRICULTURE.

BUREAU OF PLANT INDUSTRY—BULLETIN NO. 189.

B. T. GALLOWAY, *Chief of Bureau.*

THE SOURCE OF THE DRUG DIOSCOREA, WITH A CONSIDERATION OF THE DIOSCOREÆ FOUND IN THE UNITED STATES.

BY

HARLEY HARRIS BARTLETT,

CHEMICAL BIOLOGIST, DRUG-PLANT INVESTIGATIONS.

ISSUED NOVEMBER 11, 1910.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1910.

BUREAU OF PLANT INDUSTRY.

Chief of Bureau, Beverly T. Galloway.
Assistant Chief of Bureau, G. Harold Powell.
Editor, J. E. Rockwell.
Chief Clerk, James E. Jones.

Drug-Plant, Poisonous-Plant, Physiological, and Fermentation Investigations.

scientific staff.

Rodney H. True, *Physiologist in Charge.*

A. B. Clawson, Heinrich Hasselbring, C. Dwight Marsh, and W. W. Stockberger, *Physiologists.*
H. H. Bunzel and James Thompson, *Experts.*
Carl L. Alsberg, H. H. Bartlett, Otis F. Black, Frank Rabak, and A. F. Sievers, *Chemical Biologists.*
W. W. Eggleston, *Assistant Botanist.*
Alice Henkel, S. C. Hood, G. F. Klugh, Hadleigh Marsh, G. F. Mitchell, Ivar Tidestrom, and T. B. Young, *Assistants.*
G. Archie Russell, *Special Agent.*

LETTER OF TRANSMITTAL.

U. S. Department of Agriculture,
Bureau of Plant Industry,
Office of the Chief,
Washington, D. C., July 20, 1910.

Sir: I have the honor to transmit herewith, and to recommend for publication as Bulletin No. 189 of the series of this Bureau, a manuscript entitled "The Source of the Drug Dioscorea, with a Consideration of the Dioscoreæ found in the United States," prepared by Mr. Harley Harris Bartlett, Chemical Biologist in the Office of Drug-Plant Investigations, and submitted for publication by Dr. Rodney H. True, Physiologist in Charge.

For many years there has been more or less confusion among crude-drug dealers in regard to what plant should be considered the true medicinal "Dioscorea." Although there is little real evidence that our native species of Dioscorea differ much in their medicinal qualities, some authors have expressed a marked preference for a rhizome which is now very rare in the trade. It is here shown that there is better historical precedent for the use of the rhizome now handled by crude-drug dealers than for the form which of late has been preferred.

In carrying out this investigation Mr. Bartlett has found it necessary to consult much material located in many herbaria, collections, and museums. He was assisted very materially by drug specimens or information furnished by Mr. Floyd Cole (Trade, Tenn.), Mr. H. E. Ellis (St. Petersburg, Fla.), J. Q. McGuire & Co. (Asheville, N. C.), Mr. Joseph Powell (Bristol, Tenn), Mr. R. W. Proctor (Cincinnati, Ohio), and Vannoy & McNeill (North Wilkesboro, N. C.). To the following persons he is indebted for the use of herbarium specimens or notes on geographic distribution: Mr. W. H. Aiken (Lloyd Library), Prof. S. M. Bain (University of Tennessee), Mr. H. W. Barre (South Carolina Agricultural Experiment Station), Mr. C. D. Beadle (Biltmore Herbarium), Prof. W. J. Beal (Michigan State Agricultural College), Mr. Stewardson Brown (Philadelphia Academy of Natural Sciences), Prof. W. A. Buckhout (Pennsylvania State College), Mr. George H. Chapman (Massachusetts Agricultural Experiment Station), Prof. Mel. T. Cook (Agricultural Experiment Station, Dela-

ware College), Mr. C. C. Deam (Indiana State Board of Forestry), Prof. R. J. H. De Loach (University of Georgia), Prof. R. H. Denniston (University of Wisconsin), Mr. H. S. Fawcett (University of Florida), Prof. E. M. Freeman (University of Minnesota), Prof. H. Garman (University of Kentucky), Dr. H. A. Gleason (University of Illinois), Prof. F. D. Heald (University of Texas), Mr. O. E. Jennings (Carnegie Museum), Prof. F. E. Lloyd (Alabama Polytechnic Institute), Mr. J. M. Macoun (Geological Survey of Canada), Prof. L. H. Pammel (Iowa Agricultural Experiment Station), Mr. J. T. Pennypacker (Delaware Natural History Society), Prof. G. M. Reed (University of Missouri), Prof. B. L. Robinson (Gray Herbarium), Mr. A. D. Selby (Ohio Experiment Station), Prof. J. L. Sheldon (University of West Virginia), Dr. J. K. Small (New York Botanical Garden), Prof. E. A. Smith (Geological Survey of Alabama), and Prof. William Trelease (Missouri Botanical Garden). To all the above-named persons thanks are due for helpful cooperation.

Respectfully,

WM. A. TAYLOR,
Acting Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

ILLUSTRATIONS.

THE SOURCE OF THE DRUG DIOSCOREA, WITH A CONSIDERATION OF THE DIOSCOREÆ FOUND IN THE UNITED STATES.

TAXONOMIC HISTORY OF THE DIOSCOREÆ OF THE UNITED STATES.

Dioscorea, an extensively developed genus in the Tropics of both hemispheres, is represented in the eastern and central United States by five species. Of this number, two are described for the first time in this paper; the others have had a long and involved bibliographic history.

In 1705 Plukenet[a] published "Bryoniae nigrae similis floridana, muscosis floribus quernis, foliis subtus lanugine villosis, medio nervo in spinulam abeunte." In 1839 Gronovius[b] referred Plukenet's plant to Dioscorea, in the following account of a specimen which Clayton had sent him from Virginia:

Dioscorea foliis cordatis acuminatis, nervis lateralibus ad medium folii terminatis. Mas.

Bryoniae nigrae similis Floridana, etc. Plukn., Amalth., p. 46, t. 375, f. 5.

Lupuli species late scandens, foliis cordiformibus venosis, alia flore, alia semine foecunda, flores albos steriles in spica pendula ferens, seminibus membranis extantibus alatis, vasculo quoque seminali membranaceo triquetro inclusis, plurimis in racemos ad modum Lupulorum dense congestis. Clayt. n. 94.

The only Dioscorea ascribed by Linnæus to the present area of the United States was in part based upon the above citations from Plukenet and Gronovius. He treated it as follows:[c]

7. Dioscorea [villosa] foliis cordatis alternis oppositisque, caule laevi.

Dioscorea foliis cordatis acuminatis: nervis lateralibus ad medium folii terminatis. Gron. Virg. 121.

Bryoniae nigrae similis floridana, muscosis floribus quernis, foliis subtus lanugine villosis: medio nervo in spinulam abeunte. Pluk. Alm. 46, t. 375, f. 5.

Habitat in Virginia, Florida.

In attempting to decide upon the application of the name *Dioscorea villosa*, it was but natural to inquire whether there was any specimen so called in the herbarium of Linnæus. Dr. B. Daydon Jackson,

[a] Amaltheum, p. 46, t. 375, f. 5.

[b] Flora Virginica, ed. 1, p. 121.

[c] Species Plantarum, ed. 1 (1753), ii, p. 1033.

secretary of the Linnæan Society, very courteously looked into the matter, and wrote as follows:

On referring to the Linnæan herbarium, I found only one American specimen. * * * At the bottom of the sheet is the note by Linné himself, "6 K sativa," to which Smith has added in pencil, "non est;" K=Kalm. I do not find any specimen named by Linné "*villosa*" in his herbarium, but as *sativa* is an East Indian species, and the specimen is of Kalm's collection, it is patent that there is a blunder.

Since Kalm is not mentioned in the treatment of *Dioscorea villosa*, and since no localities but Virginia and Florida (these obviously refer to the citations from Gronovius and Plukenet) are mentioned by Linnæus, we can by no means typify *D. villosa* by the Kalm specimen.[a] The species must therefore be interpreted in the light of the diagnosis and synonymy given by Linnæus.

Doctor Rendle, of the British Museum, has kindly sent a photograph and description of the specimen which Clayton collected in Virginia and sent to Gronovius. It is identical with the most widely distributed Dioscorea of our range—not the most characteristic species of Virginia, to be sure, but the one which would probably have been collected in the coastal part of the State. In the matter of pubescence the species varies considerably, but, according to Doctor Rendle, the Gronovian specimen is glabrous except for puberulence on the veins and venules of the lower leaf face. It can not, therefore, have been seen by Linnæus at the time he wrote the Species Plantarum, for he would not have applied the adjective "*villosa*" to an almost glabrous plant. As a matter of fact, the specific name came from Plukenet's "Bryoniae nigrae similis floridana, muscosis floribus quernis, foliis subtus lanugine *villosis*, medio nervo in spinulam abeunte." This characterization and the figure which accompanies it are altogether vague, and in at least one point, the description of the flowers as four parted, not even in accord with the generic concept of Dioscorea. If we typify *Dioscorea villosa* by the Gronovian specimen, as there is some warrant for doing because of the fact that the first-cited locality in the Species Plantarum is Virginia, we must call a widely distributed and abundant plant by a name which is altogether inept. Richard[b] found a way out of this difficulty by renaming the northern plant, which is identical with the Gronovian specimen. His treatment follows:

D. [paniculata] caule laevi foliis brevibus, cordatis, acuminatis, racemo masc. e plurimis racemulis filiformibus quasi-paniculatim composito; capsula rotundata glabra.

[a] A photograph of Kalm's specimen, kindly sent by Doctor Jackson, shows that it should be referred to the species treated in this paper as *Dioscorea paniculata*.

[b] Michaux, Flora Boreali-Americana (1803), ii, p. 239.

D. villosa Linn.
D. quaternata et quinata Gmel.
Obs. Cultura saepe fit glabra.
Hab. a Canada ad Carolinam.

There is no reason why the name *Dioscorea paniculata* should not be adopted, for the description and range implicitly exclude the dubious plant of Plukenet.

The Vienna code provides for the rejection of names which are likely to remain permanent sources of confusion and error. On this ground the name *Dioscorea villosa* should surely be dropped. The Linnæan diagnosis differs in only one word from that of *D. sativa:*

6. Dioscorea [sativa] foliis cordatis alternis, caule laevi.
7. Dioscorea [villosa] foliis cordatis alternis oppositisque, caule laevi.

Moreover, the single character which Linnæus used to distinguish his *Dioscorea villosa* from his *D. sativa* (leaves, in the former species, alternate *and opposite*) did not apply either to Plukenet's plant or to that of Gronovius. The Gronovian specimen at the British Museum has all the leaves alternate. The sheet bears this annotation: "Hinc inde folia fert opposita, unde potius dicenda Dioscorea foliis cordatis alternis oppositisve." Plukenet's plate shows no opposite leaves. As Lamarck[a] pointed out in the passage quoted below, the character "foliis oppositis" had a bibliographic origin with Plumier and Rumphius, whose *Polygonatum scandens altissimum*, *foliis Tamni* and *Ubium nummularium* are included by Linnæus in *Dioscorea villosa*, although he does not cite them.

Je crois qu'une Igname dont les feuilles sont les unes alternes & les autres opposées, est un être de raison; que Linné n'a établi son *Dioscorea villosa* que sur les livres, en voulant faire regarder comme la même plante le *Bryoniae nigrae similis Floridana* de Plukenet, le *Polygonatum scandens altissimum* . . . de Plumier, enfin *l'Ubium nummularium* de Rumphe, qui sont trois plantes très-différentes entr'elles. Mais la plante de Plukenet n'a aucunes feuilles opposées, constatées par l'observation; au contraire, celle de Plumier, que j'ai vue, & que je décris ci-dessous, n'a aucunes feuilles alternes. Quelle est donc cette Igname de la Virginie & de la Floride, qui a en même temps des feuilles opposées & des feuilles alternes? Je n'en trouve aucun indice, soit dans les livres, soit dans les Herbiers que j'ai pu visiter. Au reste, la figure citée de Plukenet (t. 375, f. 5), ressemble beaucoup à la plante que l'on cultive au Jardin du Roi sous le nom de *Dioscorea sativa*, plante qui y subsiste en pleine terre, sans que la gelée fasse périr sa racine, ce qui me fait présumer que cette même plante n'est point des Indes, mais qu'elle est réellement originaire de la Virginie.

While Linnæus was writing the Species Plantarum, Burman was engaged in editing works of Rumphius[b] and of Plumier.[c] An ap-

[a] Encyclopèdie Méthodique Botanique, iii (1789), p. 231.

[b] Rumphii Herbarium Amboinense (1741–1755).

[c] Plantarum Americanarum fasciculus (I, II . . . etc.), continens plantas quas olim Carolus Plumierius detexit, eruitque atque in Insulis Antillis ipse depinxit (1757).

pendix[a] to the Herbarium Amboinense contains an "Index universalis," in which *Ubium nummularium* is referred to *Dioscorea villosa*. In his preface Burman states that the Linnæan references were taken from a dissertation published by Stickman under the direction of Linnæus in 1754, and therefore contemporaneous in preparation with the Species Plantarum. The dissertation was reprinted in the Amoenitates Academicae.[b]

The evidence that Plumier's *Polygonatum scandens altissimum, foliis Tamni* is included in the Linnæan concept of *Dioscorea villosa* is not so convincing as in the case of *Ubium nummularium*. The two plants are made synonyms in Burman's edition of Plumier, but whether or not with the knowledge of Linnæus it is impossible to say. Plumier's plate is of an opposite-leaved Dioscorea from the West Indies, a member of a section of the genus to which our species have no resemblance.

As compared with *Dioscorea villosa*, none of our other species are difficult of interpretation. Walter[c] published Anonymos (Dioscoreae affinis?) quaternatus, foliis cordatis septemnerviis, nervorum pari extimo bifido, acuminatis, infimis quaternis deinde ternis binis alternisque, caule sinistrorsum volubili, racemis axillaribus pendulis, floribus sursum assurgentibus, and Anonymos (Dioscoreae affinis?) quinatus, foliis peltato-cordatis, 9-nerviis, foliis infimis quinis. Gmelin[d] later copied the diagnoses and published the binomials *Dioscorea quaternata* and *D. quinata*. Walter's herbarium, at the British Museum, contains specimens of neither plant. *Dioscorea quaternata* was accepted as a good species by Pursh,[e] Nuttall,[f] Elliott,[g] Beck,[h] and Kunth,[i] and is interpreted in the traditional way in this paper. *D. quinata*, on the other hand, has always been an enigma.

In 1813 Muhlenberg[j] published *Dioscorea glauca*, a nomen subnudum. Fortunately, however, his plant is as readily identified from the descriptive name which he chose, and from the locality, as though

[a] Rumphii Herbarii Amboinensis Auctuarium (1755).

[b] Amoenitates Academicae, iv. Diss. lvi, Herbarium Amboinense sub praesidio D. D. Car. Linnaei proposuit Olavus Stickman. Upsaliae, 1754, Maj. 9.

[c] Flora Caroliniana (1788), p. 246.

[d] Linnaei Systema Vegetabilium, ed. 13 (1791), i, p. 581.

[e] Flora Americae Septentrionalis (1814), i, p. 251.

[f] Genera of North American Plants (1818), ii, p. 238.

[g] Botany of South Carolina and Georgia (1824), ii, p. 704.

[h] Botany of the Northern and Middle States (1833), p. 355.

[i] Enumeratio Plantarum (1850), v, p. 336.

[j] Catalogus Plantarum Americae Septentrionalis (1813), p. 92.

he had written a full description. He recognized two species, which he treated as follows:

Dioscorea: (1) villosa ♃ hairy Pens. fl. Jun. Virg; (2) glauca ♃ glaucous Pens. fl. Jun.

Only two species have been found in a large series of specimens from Pennsylvania. One of them, *Dioscorea paniculata*, corresponds to the *D. villosa* of Muhlenberg, and the other must therefore be called *D. glauca*. There is nothing to represent Muhlenberg's name in his herbarium at the Philadelphia Academy of Natural Sciences, but there can not be the least doubt that it has been applied to the correct plant.

Rafinesque[a] described four Dioscoreæ in 1836. Two of them *D. megaptera* and *D. hexaphylla* may be referred to *D. glauca*, and one, *D. repanda*, may be divided between *D. glauca* and *D. quaternata*. The other, *D. longifolia*, described from leaves only, it is impossible to identify.

In 1850 Kunth[b] published *Dioscorea pruinosa*. No specimen is preserved at Berlin. From his full description, however, it seems clear that the plant should be referred to *D. glauca*.

Between the years 1850 and 1909 all of our Dioscoreæ were treated in botanical works as one species under the name *Dioscorea villosa*. In the seventh edition of Gray's Manual (1909) the editors departed from current usage in taking up *D. villosa* var. *glabra*, a name obscurely published by Mr. C. G. Lloyd in 1880,[c] and afterwards used in various medical works.[d] Careful study of all the evidence available has shown that this name is likewise a synonym of *Dioscorea glauca*. Mr. Lloyd's very valuable observations on the medicinal rhizomes of the two plants distinguished by him as *D. villosa* and *D. villosa* var. *glabra* will be given due attention in another connection.

SYNOPSIS OF THE SPECIES OF DIOSCOREA.

Staminate inflorescences solitary and occurring only in the leaf axils.

Lower leaves verticillate in 4's to 7's.

Leaf blades green below when mature, usually glabrous,

1. *D. quaternata.*

Leaf blades glaucous below when mature, generally hirtellous,

2. *D. glauca.*

---

[a] New Flora of North America, second part, Neophyton (1836), pp. 88–89.

[b] Enumeratio Plantarum, v. (1850), p. 339.

[c] King, John, and Lloyd, John Uri, Supplement to the American Dispensatory (1880), pp. 81–83.

[d] Several editions of King's American Dispensatory, revised by H. W. Felter and J. U. Lloyd.

A Treatise on Dioscorea and Sulphurous Acid. Drug Treatise No. 14, issued by Lloyd Brothers (1905).

Lower leaves all alternate, or the three lowest subapproximate or verticillate.
Internodes strictly glabrous. Fruiting racemes many fruited.
Leaves pubescent beneath----------3. *D. paniculata.*
Leaves altogether glabrous----------3. *D. paniculata glabrifolia.*
Internodes hairy. Fruiting racemes 1 to 4 fruited-----4. *D. hirticaulis.*
Staminate inflorescences solitary or fasciculate in the leaf axils, and terminating the stem----------5. *D. floridana.*

1. *Dioscorea quaternata* (Walt.) Gmel. Rhizomes about 1 cm. in diameter, straight or sometimes forked, with few or no short lateral branches. Stems 1 to 2 m. long, rigid and erect below the first node, requiring support above. Lower leaves verticillate by 5's or 6's

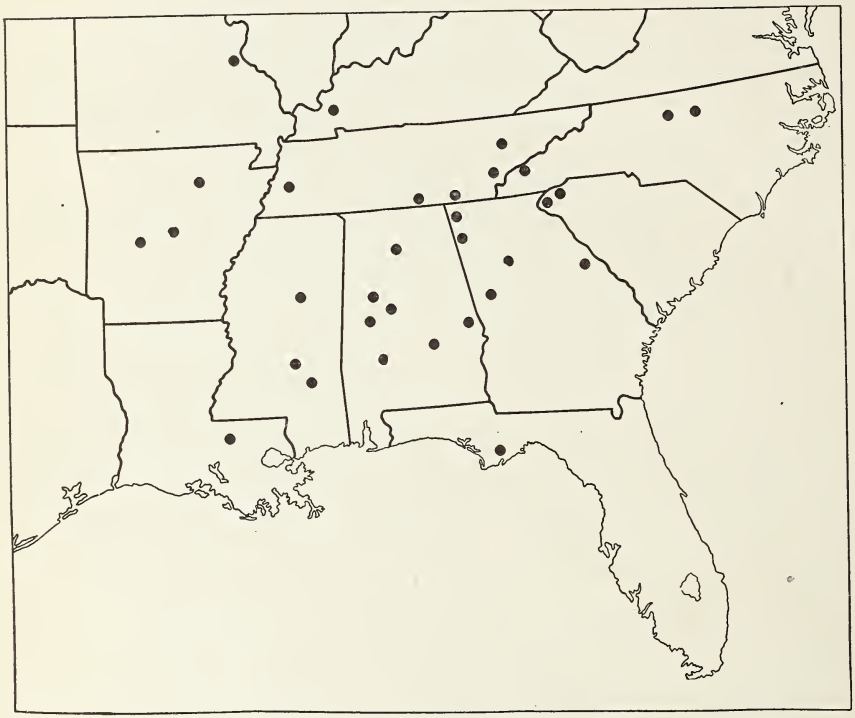

FIG. 1.—Map of the southeastern portion of the United States, showing the distribution of *Dioscorea quaternata.*

(rarely 4's or 7's); upper leaves alternate. Petioles of the lower leaves densely pubescent at base and apex, sometimes glabrate in age. Leaf blades cordate, repand, green on both sides, usually strictly glabrous except for the dense pubescence at the insertion of the petiole. Staminate inflorescences paniculate, solitary in the leaf axils, occuring even in the axils of the lower verticillate leaves. Pistillate inflorescences few flowered. Fruit 2 to 3 cm. long, very variable in shape.

The distribution of this species, as shown in figure 1, is based upon the following material:

North Carolina.—Guilford County, *Biltmore Herb.*, 364 a; Orange County, *W. W. Ashe;* Swain County, *H. C. Beardslee* and *C. A. Kofoid*, July 25, 1891.

South Carolina.—Oconee County, *H. D. House*, 3470 and 2120; Pickens County, *H. D. House*, 3079.

Georgia.—De Kalb County, *H. Eggert*, May 22, 1897, and *W. W. Ashe*, May, 1896; Floyd County, *Chapman Herb.;* McDuffie County, *H. H. Bartlett*, 1722 and 1733; Walker County, *Percy Wilson*, 197; Meriwether County, *S. M. Tracy*, 9208.

Alabama.—Bibb County, *E. A. Smith*, July 20, 1879; Cullman County, *H. Eggert*, June 21, 1897, and *C. F. Baker*, May 18, 1897; Hale County, *S. Watson*, in 1857; Lee County, *F. S. Earle* and *C. F Baker*, April 24, May 8, and October 2, 1897; Montgomery County, *C. Mohr;* Tuscaloosa County, *E. A. Smith*, 1287 and 1516; Wilcox County, *S. B. Buckley*, May, 1839.

Florida.—Franklin County, *Chapman.*

Louisiana.—East Baton Rouge Parish, *W. R. Dodson.*

Mississippi.—Choctaw County(?), *I. M. Clute*, 68; Jones County, *S. M. Tracy*, 3355; Smith County, *S. M Tracy*, August 22, 1903.

Arkansas.—Garland County, *William Trelease*, October 3, 1898, and *S. E. Meek*, August 19, 1889; Independence County, *F. V. Coville*, 180; Pulaski County, *H. E. Hasse*, April 11, 1886.

Missouri.—Jefferson County, *H. Eggert*, July 15, 1892.

Tennessee.—Franklin County, *A. Gattinger;* Hamilton County, *F. Lamson-Scribner*, May 21, 1890; Haywood County, *S. M. Bain*, June 13, 1893; Knox County, *A. Ruth*, 779 and 1200 a; Monroe County, *F. Lamson-Scribner*, June 29, 1890.

Kentucky.—Lyon County, *W. W. Eggleston*, 4674.

2. *Dioscorea glauca* Muhl. Rhizomes 1 cm. or more in diameter, often forked and with many short lateral branches equal in diameter to the rhizome, usually much contorted and forming dense masses. Stems 1 to 3 m. long, rigid and erect below the first node, requiring support above. Lower leaves verticillate in whorls of 5 to 7; upper leaves alternate. Petioles densely pubescent at the apex. Leaves larger than in *D. quaternata*, less markedly repand or not at all so, usually sparsely hirtellous beneath, but often glabrous, always glaucous when mature. Paniculately branched staminate inflorescences solitary, occurring in all the leaf axils. Pistillate inflorescences few flowered; fruits 2 to 3 cm. long.

Dioscorea glauca is essentially a plant of the mountains, although in the northern part of its range it is found near sea level. In the lowlands southward it is replaced by the closely related *D. quaternata.* As will be seen from the map (fig. 2) the ranges of the two species hardly overlap.

The following specimens have been examined:

Pennsylvania.—Allegheny County, *J. A. Shafer*, 590, and *C. C. Mellor*, June 7, 1889; Fulton County, *Witmer Stone*, June 4, 1905; Huntingdon County, *O. E. Jennings*, May 17, 1904; Lancaster County, *J. J. Carter*, May, 1870, and *A. A. Heller*, June 5, 1900; Susquehanna County, *A. Stengel*, May 29, 1886; Westmoreland County, *O. E. Jennings*, May 19, 1904; York County, *J. N. Rose* and *J. H. Painter*, 8123.

Delaware.—Newcastle County, *William M. Canby*, July, 1893.

Maryland.—Garrett County, *G. A. Eifrick*, May, 1902; Montgomery County, *A. Chase*, 2313 and 2827½, and *H. H. Bartlett*, 1821; Prince Georges County, *A. Chase*, 2215; District of Columbia, *E. S. Steele*, 67, and *H. D. House*, 709.

Virginia.—Alexandria County, *A. S. Hitchcock*, September, 1904, and *L. H. Dewey*, 239; Bedford County, *A. H. Curtiss*, 43953; Campbell County, *S. B. Buckley;* Fairfax County, *E. L. Morris*, June, 1896, and *L. H. Dewey*, 232; Loudoun County, *A. Chase*, 2244; Russell County, *C. L. Alsberg*, 54 and 120; Smyth County, *J. K. Small*, June 4, 1892.

West Virginia.—Barbour County, *J. M. Greenman*, 93; Monongalia County, *O. E. Jennings*, July 4, 1909; Preston County, *J. L. Sheldon*, 1454, and *E. S. Steele*, August 18, 1898; Upshur County, *W. M. Pollock*, May 30, 1895, and May 31 and June 12, 1897.

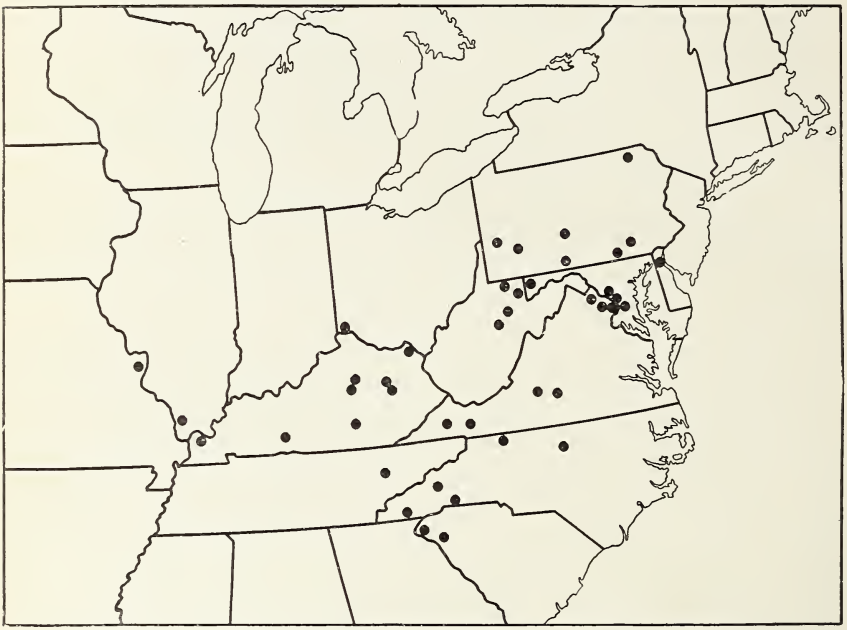

FIG. 2.—Map of the eastern portion of the United States, showing the distribution of *Dioscorea glauca*.

Ohio.—Hamilton County, *C. G. Lloyd.*

Illinois—Union County, *F. S. Earle*, 763, and *Mrs. C. Butler*, August 13, 1880.

Kentucky.—Fayette County, *W. A. Kellerman*, in 1882; Greenup County, *John Butler*, in 1909; Jessamine County, *H. Garman;* McCracken County, *Biltmore Herb.*, 364 c; Menifee County, *H. Garman*, May 8, 1893; Pulaski County, *C. W. Mathews*, July 11, 1892; Warren County, *S. F. Price*, May 21, 1900; Wolfe County, *M. L. Didlake*, June, 1898.

Missouri.—St. Louis County, *N. M. Glatfelter* (?), 517.

Tennessee.—Knox County, *F. Lamson-Scribner*, May 14, 1889.

North Carolina.—Buncombe County, *Biltmore Herb.*, 364, and *F. Crayton* and *W. W. Eggleston*, 4398; Macon County, *L. R. Gibbs*, in 1881; Orange County, *W. W. Ashe*, June, 1898; Polk County, *J. R. Churchill*, May 30, 1899, and *E. C. Townsend*, April 29, 1897; Surry County, *H. H. Rusby*, June 18, 1909.

South Carolina.—Anderson County, *L. R. Gibbs*, in 1885; Oconee County, *A. P. Anderson*, 1502.

3. *Dioscorea paniculata* Michx. Rhizomes long and slender, simple or rarely forked, less than 1 cm. in diameter, with a few short lateral branches of less diameter. Stem 1 to 4 m. long, flexuous, glabrous. Leaves all alternate, or two or three of the lowest subapproximate, pubescent or puberulous beneath. Petioles glabrous at the insertion of the blade, or, if pubescent, less densely so than the blades. Staminate inflorescences solitary, borne only in the leaf axils of the upper half of the stem, the three or four lowest less branched than those higher up. Pistillate inflorescences densely many fruited. Capsules 2 cm. long or less.

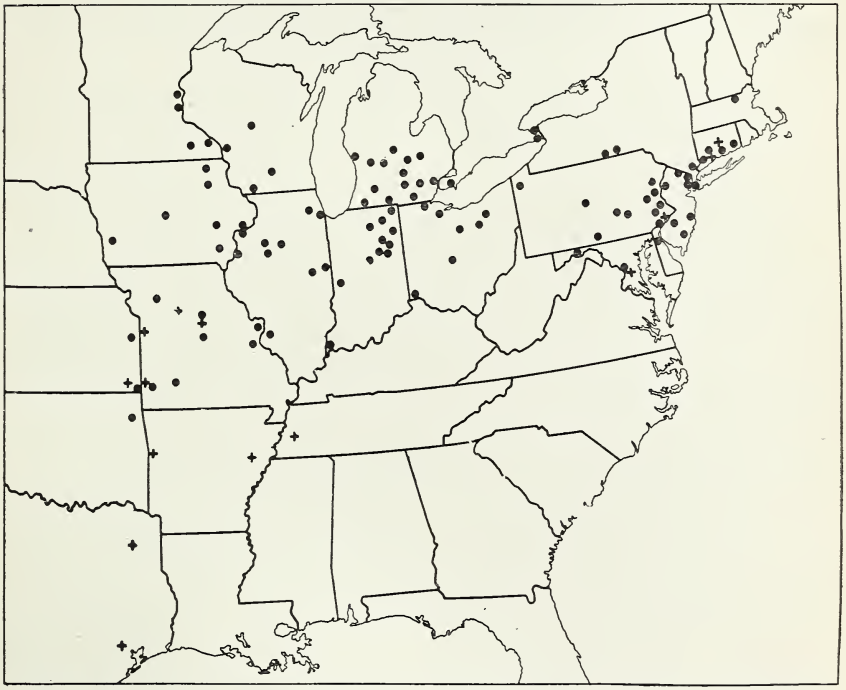

FIG. 3.—Map of the eastern portion of the United States, showing the distribution of *Dioscorea paniculata* (by dots) and its variety *glabrifolia* (by crosses).

Var. *glabrifolia* Bartlett.[a] Leaves altogether glabrous. This variety replaces the typical form of the species in the southwestern part of the range. Various northeastern specimens are indistinguishable from the southwestern plant, but may be genetically distinct from it. In the distribution map (fig. 3) the range of the variety is shown by crosses.

[a] *Dioscorea paniculata glabrifolia* var. nov. Foliis glabris exceptis, formae speciei typicae omnino similis. *A. S. Hitchcock*, 830 (pro parte) "Woods, Cherokee Co., Kansas, 1896."

The following specimens of *Dioscorea paniculata* have been examined:[a]

Connecticut.—Fairfield County, *C. L. Pollard*, 115; Middlesex County, *J. H. Redfield*, 7952, and *S. B. Buckley*, September, 1835; New Haven County, *C. H. Bissell*, 203, and *A. L. Winton*, July 8, 1886; New London County, *G. R. Lumsden*, July 16, 1885.[b]

New York.—Chemung County, *T. F. Lucy*, 712; New York County, *N. L. Britton*, July 22, 1879; Tioga County, *F. V. Coville*, June 4, 1887, and *F. E. Fenno*, 401; Westchester County, *G. V. Nash*, July 2, 1896.

New Jersey.—Atlantic County, *C. A. Gross;* Bergen County, *N. L. Britton*, September, 1883; Camden County, *E. B. Bartram*, August 3, 1907; Hudson County, *A. C. Hexamer* and *F. W. Maier*, August 17, 1852, and *William M. Van Sickle*, July 1, 1894; Ocean County, *J. H. Grove*, July 16 and August 21, 1908; Passaic County, *G. V. Nash*, July, 1889; Warren County, *Albrecht Jahn*, September 14, 1895, *Thomas C. Porter* and *A. A. Tyler*, June 27, 1896.

Delaware.—Newcastle County, *A. Commons*, July, 1866.

Maryland.—Allegany County, *Howard Shriver*, in 1894; District of Columbia, *F. Blanchard*, September 17, 1890, *L. F. Ward*, July 8, 1878, and *C. L. Pollard*, 605.

Pennsylvania.—Bucks County, *Bayard Long*, July 6, 1909; Center County, *W. A. Buckhout*, October, 1909; Crawford County, *O. E. Jennings*, August 19, 1904, and *J. A. Shafer*, July 23, 1901; Dauphin County, *J. K. Small*, July 18, 1888; Delaware County, *S. S. Van Pelt*, June 24, 1906; Franklin County, *I. A. Keller*, July 28, 1895; Lebanon County, *J. K. Small*, December, 1891; Lehigh County, *A. F. K. Krout*, June, 1878; Monroe County, *Joseph Crawford*, July 4, 1896; Montgomery County, *Alexander MacElwee*, June 26, 1892; Northampton County, *A. A. Tyler*, 550, and *Bayard Long*, June 29, 1908; Philadelphia County, *J. H. Redfield*, 7951.

Ontario.—Essex County, *Macoun*, July 24, 1892; Lincoln County, *W. C. McCalla*, 244; Welland County, *Cameron*, August, 1892.

Ohio.—Franklin County, *E. B. Williamson*, June 22, 1897; Hamilton County, *C. G. Lloyd*, June 25, 1890, and *W. H. Aiken*, June 15, 1902; Lucas County, *Lewis Schultz*, 1705; Richland County, *E. Wilkinson*, 10214; Sandusky County, *M. J. Persing*, July 10, 1897; Summit County, *L. D. Stair*, June 26, 1896; Wayne County, *A. Russ*, 435, and *A. D. Selby* and *J. W. T. Duvel*, 436.

Michigan.—Branch County, *J. Shaddick*, July 29, 1896; Cass County, *H. S. Pepoon*, 452; Genesee County, *D. Clark;* Gratiot County, *C. A. Davis*, July 10 and October, 1892; Ingham County, *C. F. Wheeler*, June 20, 1895; Ionia County, *F. P. Daniels*, June, 1896; Jackson County, *Houghton*, July 13, 1838; Kalamazoo County, *Houghton*, August 2, 1838; Kent County, *A. A. Crozier*, July 11, 1886; Lenawee County, *W. J. Beal*, in 1886; Muskegon County, *C. D. McLouth*, September 7, 1898; Shiawassee County, *G. H. Hicks*, July 13, 1889; Washtenaw County, *Houghton*, July 2, 1838; Wayne County, *William Boote*, June 26, 1871.

Wisconsin.—Dane County, *H. L. Russell*, June 20, 1887, and *L. S. Cheney*, July 5, 1890; La Crosse County, *L. H. Pammel*, July, 1887; Lafayette County, *L. S. Cheney*, June 26, 1890; Wood County, *B. M. Vaughan*, July, 1883.

---

[a] The occurrence of *Dioscorea paniculata* in Middlesex County, Massachusetts, shown in figure 3, is based upon Bigelow's report of the plant as "rare" in "woods on the Concord turnpike." (Florula Bostoniensis, 2d ed., 1824, p. 369.) It has not been reported since.

[b] Of all the specimens cited in this synopsis, only this one had branched pistillate inflorescences.

Minnesota.—Chisago County, *B. C. Taylor*, August, 1892; Olmsted County, *Mrs. George Ainslie*, May 28, 1895; Washington County, *H. Eggert*, July 12, 1892; Winona County, *J. M. Holzinger*, August 21, 1888.

Indiana.—Allen County, *C. C. Deam*, 1157; Blackford County, *C. C. Deam*, 1101; Grant County, *C. C. Deam*, 2177; Huntington County, *C. C. Deam*, 2146; Kosciusko County, *C. C. Deam*, 3205; Noble County, *C. C. Deam*, 316; Parke County, *H. H. Bartlett*, June 25, 1903; Posey County, *C. C. Deam*, 910; Steuben County, *C. C. Deam*, June 16, 1903; Tippecanoe County, *H. B. Dorner*, July 4, 1901; Wells County, *C. C. Deam*, 4.

Illinois.—Champaign County, *M. B. Waite*, June 28, 1886; Cook County, *A. Chase*, June 1, 1896; Dupage County, *L. M. Umbach*, August 18, 1897, June 16 and July 2, 1898; Henderson County, *H. N. Patterson*, 43954; Marshall County, *V. H. Chase*, 1488; Peoria County, *F. E. McDonald*, July, 1893; St. Clair County, *H. Eggert*, June 24, 1875, and August 28, 1878; Stark County, *V. H. Chase*, 623; Rock Island County, *C. C. Parry*, July, 1865; Vermilion County, *M. B. Waite*, June 24, 1886.

Iowa.—Fayette County, *B. Fink*, 472; Henry County, *J. H. Mills*, 531; Johnson County, *Fitzpatrick*, June, 1896; Pottawattamie County, *F. V. Hayden*, July 5, 1853; Scott County, *C. C. Parry;* Story County, *A. S. Hitchcock;* Winneshiek County, *E. W. D. Holway*, June 30, 1882.

Missouri.—Boone County, *F. P. Daniels*, June 13, 1903; Caldwell County, *J. E. Townsend*, September, 1869; Cole County, *O. Krause*, June, 1867; Greene County, *J. W. Blankinship*, 2477; Jasper County, *E. J. Palmer*, 527; Jefferson County, *H. Eggert*, June 26, 1892; St. Louis County, *H. Eggert*, June 14, 1893.

Kansas.—Cherokee County, *A. S. Hitchcock*, 830 (*pro parte*); Miami County, *J. H. Oyster.*

Oklahoma.—District 2, Indian Territory, *B. F. Bush*, 1137.

The following specimens of the variety *glabrifolia* have been examined:

Connecticut.—Middlesex County, *S. B. Buckley*, September, 1835; New Haven County, *Robbins.*

Pennsylvania.—Philadelphia County, *S. S. Van Pelt*, July 10, 1908.

Maryland.—Prince Georges County, *H. H. Bartlett*, 1873.

Tennessee.—Haywood County, *S. M. Bain*, 321.

Missouri.—Boone County, *F. P. Daniels*, June, 1903; Cass County, *G. C. Broadhead*, June, 1865; Jasper County, *B. F. Lutman*, August 1, 1901, and *E. J. Palmer*, 832; Saline County, *William Trelease*, June 23, 1886.

Kansas.—Cherokee County, *A. S. Hitchcock*, 830 (*pro parte*).

Arkansas.—St. Francis County, *William Trelease*, August 20, 1897; Sebastian County, *J. M. Bigelow*, in 1853–54.

Texas.—Harris County, *J. F. Joor*, June 20, 1877; Upshur County, *J. Reverchon*, 2497 and 4033.

4. *Dioscorea hirticaulis* Bartlett.[a] Rhizome less than 1 cm. in diameter, simple or rarely forked, nearly straight, bearing short lat-

[a] *Dioscorea hirticaulis* sp. nov. Rhizoma horizontale, plerumque simplex vel raro furcatum, usque ad 50 cm. longum, crassitudine ca. 8 mm.; ramulis paucis lateralibus abortivis quam rhizomate multo tenuioribus, 0.5–2 cm. longis; caulium cicatricibus saepe inter se 10–12 cm. distantibus saepe binis trinisve approximatis. Caulis gracilis scandens flexuosus 2–3-metralis, hirtellus. Folia infima 3 verticillata vel propinqua, superne alterna, laminis cordatis 7–9 nerviis, supra glabris subtus griseo-pubescentibus, margine saepissime repandis; petiolis,

eral branches of 2 to 3 mm. diameter. Stem 1 to 3 m. long, flexuous, weak, pubescent. Leaves all alternate, or the three lowest verticillate or subapproximate, griseous-pubescent beneath and also, though not so densely, on the apex of the petiole. Staminate inflorescences solitary in the leaf axils of the upper half of the stem, the lowest simple or with one branch, the others increasingly paniculate. Pistillate inflorescences developing from 1 to 4 fruits, which are about 2 cm. long.

Dioscorea hirticaulis is probably confined to the region of the fall line and to the Coastal Plain, for no stations are known further inland. As it occurs about Thomson, Ga., it is confined to the branch swamps, where its long rhizomes run horizontally barely beneath the surface of the black muck soil. The only other Dioscorea of the region, *D. quaternata*, with which it shows not the least intergradation, has a totally different habitat.

Specimens examined:

North Carolina.—Cumberland County, *Biltmore Herb.*, 364 b.
South Carolina.—Berkeley County, *H. W. Ravenel.*
Georgia.—McDuffie County, *H. H. Bartlett*, 1468.

5. *Dioscorea floridana* Bartlett.[a] Rhizomes unknown. Stem flexuous, twining. Leaves alternate, entirely glabrous, green above, paler beneath. Staminate inflorescences paniculate, terminating the stem and also fasciculate by twos and threes in the upper leaf axils, the larger axillary inflorescences sometimes 40 cm. long. Pistillate inflorescences solitary, 5 to 7 flowered. Fruits about 2 cm. long, similar in shape to those of *D. paniculata.*

This species is very clearly distinguished from our other species by the position of the staminate inflorescences. In material collected by Mr. Harper in Georgia the larger inflorescence of an axillary fascicle exceptionally bears one or two leaf-like bracts. As at the end

praecipue ad apicem versus, hirtellis. Inflorescentiae masculae solum in foliorum axillis superiorum positae, densiflorae, inferiores vix ramosae, superiores paniculatae; pedunculo perbrevi ramulisque sub lente pubescentibus, alato-angulatis. Perigonium 6-partitum immaculatum. Stamina 6, filamentis perbrevibus; antheris bifido-didymis. Spicae femineae solitariae 1–4 florae; capsulis circumscriptione obcordatis 2 cm. longis, aetate castaneis. Semina fusca.—*H. W. Ravenel*, "Santee Canal, South Carolina" (♂); *H. H. Bartlett*, 1468, "Branch swamp," McDuffie County, Georgia, September 18, 1908 (♀).

[a] *Dioscorea floridana* sp. nov. Rhizoma ignotum. Caulis scandens, flexuosus, glaber. Folia cordata, alterna, utrinque glabra, supra viridia, subtus pallidiora, 7-nervia, nervis exterioribus bifurcatis. Inflorescentiae masculae paniculiformes et caulem terminantes et binis trinisve in foliorum axillis superiorum fasciculatae; floribus aut singulis aut binis sessilibus, valde flavis, maculatis; staminibus haud didymis. Spicae femineae pendulae, solitariae, ca. 6-florae. Capsulae forma eis *D. paniculatae* similes, ca. 2 cm. longae.—"Moist thickets, Lake City, Fla.," P. H. Rolfs, 266 (♂), June 18, 1894; Charleston, S. C., in Herb. Bost. Soc. Nat. Hist. (♀).

of the stem, however, the transition from leaves to subulate bracts is not gradual but sharp.

Specimens examined:

South Carolina.—Charleston County (specimen in Herb. Bost. Soc. Nat. Hist.).

Georgia.—Jefferson County, *M. H. Hopkins*, 91; Sumter County, *R. M. Harper*, 1389.

Florida.—Columbia County, *P. H. Rolfs*, 266; Escambia County, *A. H. Curtiss*, in 1885.

THE DRUG DIOSCOREA.

According to Mr. C. G. Lloyd the rhizome of Dioscorea was first brought to the attention of "botanic physicians" by Dr. J. L. Riddell[a] in 1835, although before that time it had been used more or less as a "secret remedy."[b] Riddell's account of the plant, which was copied in part by most subsequent writers, was as follows:

1501. Dioscorea villosa, Linn. Yam root. China root. May–June. Yellow-white. Climbing vine, 6 to 12 f. Root woody, tortuous, echinate. Open woods. Bottom lands. Western States. An infusion of the powdered root is to be boiled in a pint of water, and half of it given at once. * * * I have been informed that Doctor Miller, of Neville, Ohio, values the tincture highly as an expectorant. He says it is also diaphoretic, and, in large doses, emetic."

In 1836, a year later, William Hance[c] published a much fuller account of Dioscorea, which, on account of the evidence it affords regarding the identity of the species used at that time, is here quoted in full:

Dioscorea villosa. *Common names—Yam root, China root.*—This plant is a twining and climbing vine, resembling in some respects the morning glory. The root is of a most singular tortuous form, of a woody consistence, with numerous spiny protuberances. It is perennial, and doubtless endures a greater number of years than the roots of most plants of similar habits. The sprangles are usually near half an inch in thickness, and the whole root in favorable situations is often found to weigh half a pound. The stem is a climbing annual vine, winding around small shrubs, and insinuating itself among brambles, often attaining the height of 6 or 8 feet. Near the ground the leaves usually appear in verticillate clusters, or whorls, varying in number from two to eight or more in a bunch, dependent on the luxuriance of the soil. Higher up the leaves are alternate. They are always on pretty long footstalks and of the form of a heart, with the point acute and turned to one side; commonly roundish as well as cordate and nearly 2 inches across. Almost always you may count just nine nerves or portions of framework, proceeding from the base toward the apex. The flowers show themselves in May and June; they are very small and white, arranged on little stems which come out just above the leaves. The seeds are triangular, some like buckwheat, though four times as large, with wings at the angles. The yam root grows plentifully in the Western States, delighting in fertile hillsides, thickets, and open woods.

---

[a] A Synopsis of the Flora of the Western States (1835).

[b] See Transactions, N. Y. State Eclectic Medical Society, for 1870. D. E. Smith, "Dioscorea."

[c] Howard's Botanic Medicine, ed. 3 (1836), ii, p. 240.

An infusion of the root is a valuable remedy in bilious colic. An ounce of the powdered root must be boiled in a pint of water, and half of it given at a dose. * * * I have been informed that Doctor Miller, of Neville, Ohio, values the tincture highly as an expectorant. He says it is also diaphoretic, and in large doses emetic.

For the introduction of the dioscorea into this work we are indebted to the kindness of our friend, Dr. J. L. Riddell. He has not informed us upon what principle it is supposed to afford relief in bilious colic, whether as an anodyne, cathartic, or some other. We have no doubt, however, of its value in this complaint, and, at the same time, think it highly probable that further investigation will disclose its usefulness in other diseases.

It will be observed that the plant described by both Riddell and Hance was *Dioscorea glauca* Muhl. The description of the rhizome as "singularly tortuous, with numerous spiny protuberances" and "sprangles usually near half an inch in thickness," and of the leaves as "verticillate, from two to eight in a bunch," leaves no doubt concerning the plant which they used. In this connection it should be observed (see fig. 2) that *D. glauca* occurs in southern Ohio, where Riddell might have observed it. By the time King[a] published his Dispensatory, however, one of the species with slender rhizomes had come into use in eclectic medical practice. King's description included characters of two or three species and was obviously compiled from earlier authors. The rhizome, however, he undoubtedly described from his own knowledge of it as "long, woody, contorted, from an eighth to a fourth of an inch in diameter." He doubtless used *D. paniculata*. This species was also used by W. S. Merrell in the preparation of his "dioscorein," and at that time (about 1850) was the only plant recognized by the eclectic school as "*Dioscorea villosa*." It must be remembered, however, that the "*D. villosa*" of "Howard's Botanic Medicine" was *D. glauca*. The history of dioscorea between 1850 and 1880 can not be better outlined than by quoting from Mr. C. G. Lloyd's article in the Supplement to the eighth edition of King's Dispensatory.[b] In order to make the quotations intelligible the "Plate VII," which is referred to, is here reproduced as figure 4:

The rhizoma of *Dioscorea villosa* is a favorite therapeutical agent among our eclectic physicians, who have advantageously used it for more than forty years. It is known as wild yam and colic root. The first specimens employed were from the *Dioscorea villosa*, with pubescent leaves (fig. 2, Pl. VII), now known as the "true wild yam." About the year 1850 botanic druggists noticed the admixture by root diggers of the rhizomata represented by figure 1, Plate VII, and for a considerable time rejected it as an adulteration. The diggers insisted, however, that both "roots" were obtained from vines almost identical in appearance (although they can distinguish between them), and finally purchasers were compelled to accept them, more especially as the

[a] American Eclectic Dispensatory (1854), p. 440.

[b] Supplement to the American Dispensatory, by John King and John Uri Lloyd (1880), pp. 81–83.

true rhizomata became very scarce. Mr. H. M. Merrell, of Cincinnati, Ohio, to whom we are indebted for this information, states that the first heavy shipments of the false "wild yam root" to eastern houses were made about 1860, which article purchasers refused to accept, but after some correspondence, coupled with the fact that the true wild yam could not at that time be obtained, the parties concluded to receive it. Since then the two rhizomata have been sold indiscriminately, although but little of the original drug is to be found in the market. Eclectic physicians are aware of the difference between these rhizomata and refuse to use the "false" variety, insisting that it does not possess the medicinal properties, and can not safely be substituted for the "true." In this connection we invite attention to the accurate engravings of each variety of the rhizomata in Plate VII. [See fig. 4.]

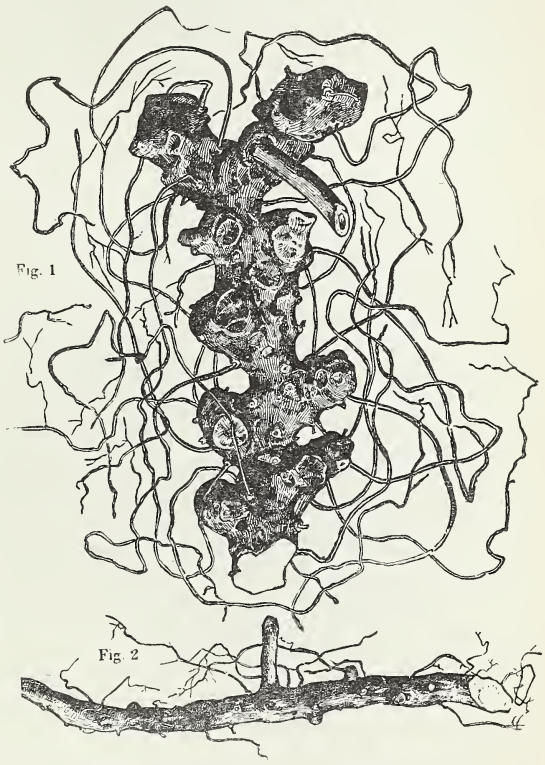

FIG. 4.—Reproduction of Plate 7, "*Dioscorea villosa*," from King and Lloyd's "Supplement to the American Dispensatory." (Reduced one-third.)

The rhizoma of *Dioscorea villosa* (Pl. VII, fig. 2) appears in market in slender contorted pieces from one-fourth of an inch to half an inch in diameter, and often 2 feet in length. It is oval, being flattened above and below as it creeps in a horizontal position beneath the surface of the ground. It seldom throws out branches, but occasionally little protuberances project from its sides, being from one-eighth of an inch to an inch in length and about one-third as large in diameter as the primary rhizoma. They are rounding at the extremity, and seem to indicate an abortive attempt of the rhizoma to throw out branches, but they do not send up the vine. Along the upper side of the rhizoma are stem scars, which are about three-fourths of an inch apart. The epidermis is brown, thin, and scales off, more or less, upon drying, especially when the rhizoma is gathered in the spring, but which is not the case with a good quality of it when dug in autumn. The internal color of the dry rhizoma is whitish, or slightly straw colored, when gathered in the autumn, but it is often brown when collected early in the season; there is no bark to it. Under a magnifying glass the texture of a broken rhizoma appears mealy and perforated with numerous woody bundles. Attached to the lower part of the rhizoma an abundance of strong, wirelike fibers will be observed. * * * *Dioscorea villosa* has one of the firmest of rhizo-

mata, it being very difficult to powder or crush. It has no odor and but little taste beyond a slight acridity after prolonged chewing. The virtues appear to reside in an acrid resin, almost insoluble in water, but readily extracted by alcohol. The so-called dioscorein is not a definite principle of the rhizoma, but is simply a dried solid extract, and to call it otherwise is a misnomer.

Dioscorea villosa var. *glabra*.—This appears to us to be a distinct variety, chiefly differing from the preceding in the entire dissimilarity of its rhizomata.

FIG. 5.—Rhizome of *Dioscorea glauca*. Mountain form from the summit of House and Barn Mountain in Russell County, Virginia, collected by C. L. Alsberg. (Three-fourths natural size.)

This plant closely resembles the true wild yam in its general shape, and in the structure of its leaves, flowers, and fruit. The leaves, however, are entirely glabrous and are not covered with a short pubescence underneath. This distinction we have invariably found in every instance where we have examined the growing plants, hence the undersurface of the leaf will readily determine the character of the rhizoma. The two plants likewise appear to differ in their manner of growth, the *D. villosa* often growing in dense clumps while the variety *glabra* is generally found isolated.

The rhizoma (Pl. VII, fig. 1) of *D. villosa* var. *glabra* resembles that of *Collinsonia Canadensis* more nearly than it does the true *D. villosa*. It is found as a rough clump of a pound or more in weight when fresh, thickly branched, each branch shooting from the side of the main rhizoma at an angle inclining backward and upward. The branches almost touch each other, are as large as the rhizoma, and are from 1 inch to 3 inches in length. Along their upper surface are numerous cup-shaped stem scars, which are about one-fourth of an inch or one-third of an inch in diameter and so thickly inserted as to intrude upon each other. The vine of the true *D. villosa*, upon the contrary, springs from the main rhizoma. The diameter of the rhizoma and of the ramifications is from half an inch to three-fourths of an inch, and the length seldom more than 6 inches. Internally

the rhizoma resembles that of the true wild yam, while the lower portion is in like manner covered with stout fibrous rootlets. The color is generally a very much darker brown.

It will be observed that Mr. Lloyd's "true" wild yam is *Dioscorea paniculata* and that his "false" variety is *D. glauca*, the species first authoritatively introduced into eclectic practice. With regard to his criterion for distinguishing "*D. villosa*" from "*D. villosa* var.

FIG. 6.—Rhizomes of *Dioscorea paniculata* from Agricultural College, Ingham Co., Mich., collected by W. J. Beal. (Two-thirds natural size.)

glabra" (the pubescence of the lower leaf face), it must be said that *D. glauca*, the plant with the large, coarse rhizome, although sometimes glabrous, is oftener somewhat pubescent on the leaves beneath, and that *D. paniculata*, the species with slender rhizomes, has a variety with the leaves entirely glabrous. To make this point clear, the attention of the reader is directed to figure 5, which illustrates the rhizome of a specimen of *D. glauca* with the leaves slightly

pubescent beneath, and figures 6 and 7, illustrating rhizomes of *D. paniculata* and its variety *glabrifolia*.

When *Dioscorea glauca* grows at low altitudes its rhizome is less branched and contorted than when it grows in the mountains. In the vicinity of Washington, D. C., its rhizome is often as unbranched as the rhizome of *D. quaternata*, and might be mistaken for that

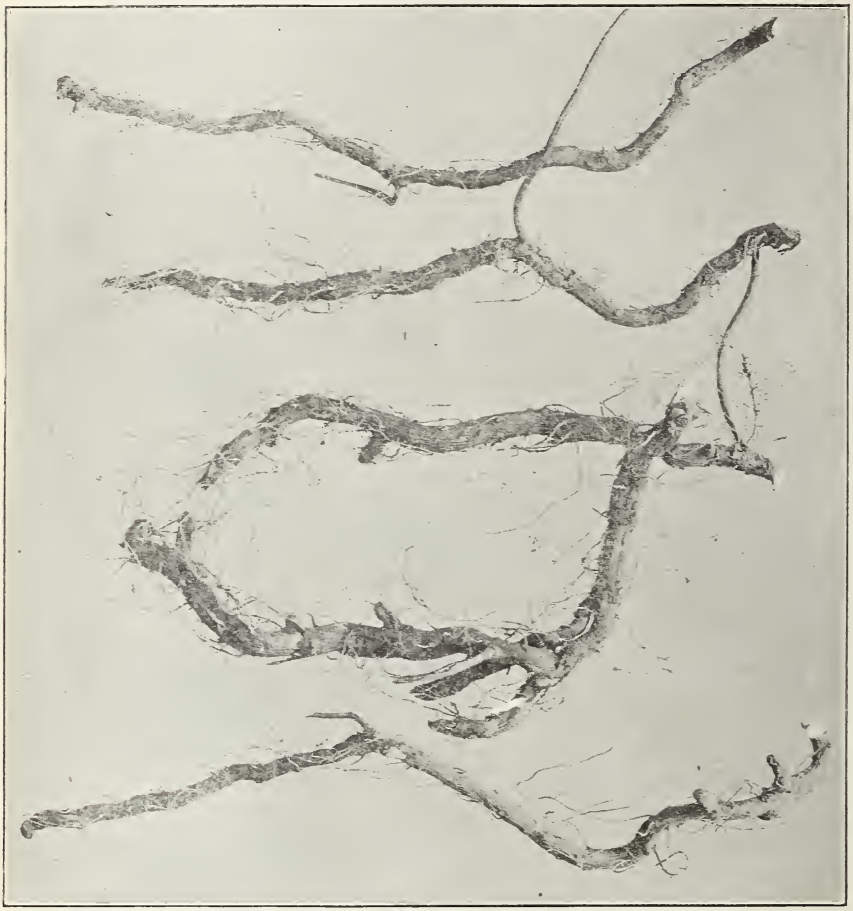

FIG. 7.—Rhizomes of *Dioscorea paniculata* var. *glabrifolia* from Glenndale, Prince Georges Co., Md., collected by H. H. Bartlett. (Two-thirds natural size.)

species, but its greater diameter still suffices to distinguish it from *D. paniculata*. The form of rhizome which occurs most frequently in the drug trade at the present time is well illustrated by figure 8. This particular specimen was obtained through the kindness of Mr. R. W. Proctor, of Cincinnati, Ohio. As a general rule, collectors of Dioscorea who supply the drug market do not distinguish between

the different kinds. The same common names are used for all of the species. Wild yam is the name used over the largest area. The following names have also been reported by correspondents of the

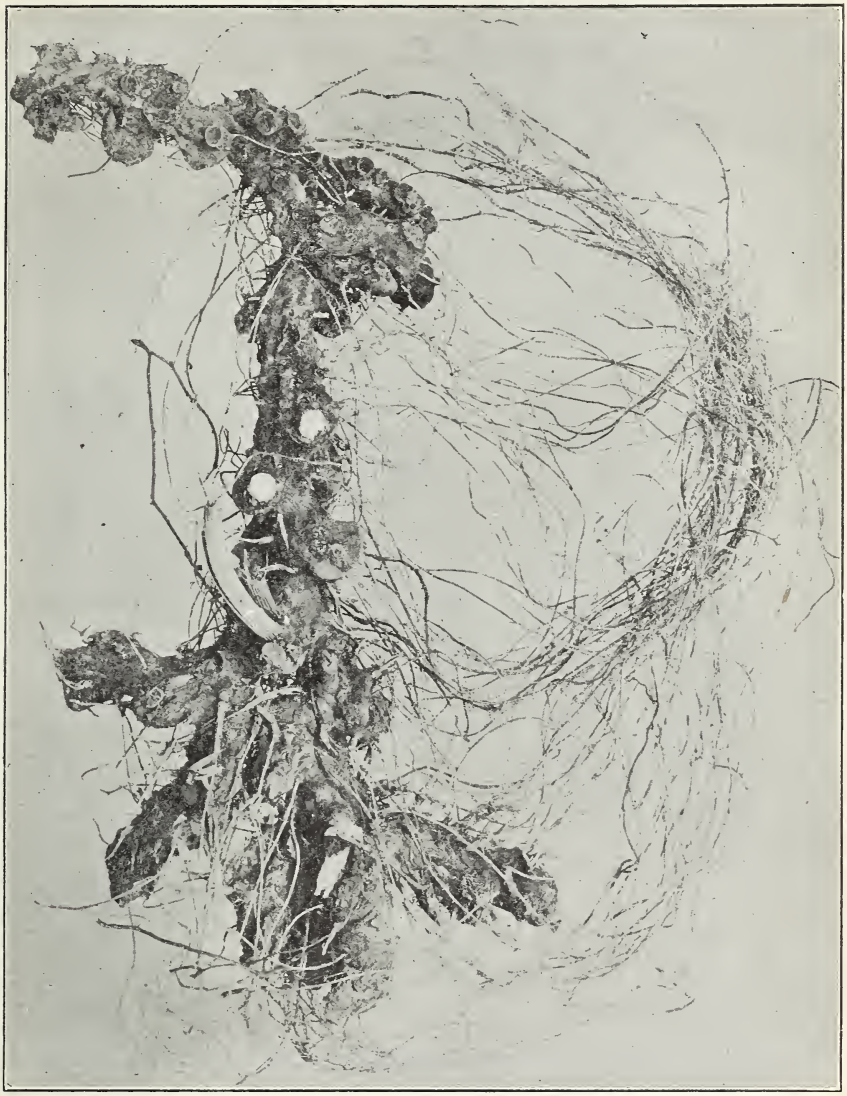

FIG. 8.—Rhizome of *Dioscorea glauca*. Typical drug from South Portsmouth, Greenup Co., Ky., collected by John Butler. (Two-thirds natural size.)

Department of Agriculture: Colicroot, chinaroot, devil's-bones (North Carolina); hobs-grub (Tennessee); rattlebox, cramproot (Kentucky).

INDEX.

189